

## CLAIMS

What is claimed is:

1. A milking claw for a dairy animal having an udder having at least one teat, said claw having a top having at least one inlet directing incoming milk flow into said claw respectively from said at least one teat, said claw having a bottom having an outlet subject to vacuum for drawing milk therefrom, said outlet comprising a tubular member extending laterally from said claw bottom and having a flow passage of a first vertical height, a nozzle having an opening passing milk therethrough from said claw bottom to said flow passage, said nozzle opening having a second vertical height less than said first vertical height, such that milk level in said claw bottom need only rise to the level of the second lower vertical height of said 5 nozzle opening rather than to the level of the first higher vertical height of said flow passage of said outlet tubular member, to provide a pressure differential between the vacuum in said outlet and the vacuum in said claw, whereby to draw milk from said claw in smaller more frequent slugs as compared to higher volume less frequent slugs while otherwise waiting for milk level in said claw bottom to rise to the level of said 10 15 first vertical height.

2. The milking claw according to claim 1 wherein said outlet gravitationally drains said claw bottom, including in the absence of said vacuum.

3. The milking claw according to claim 1 wherein said flow passage of said outlet tubular member has a first cross-sectional flow area, and said nozzle opening has a second cross-sectional flow area, and wherein said second cross-sectional flow area is greater than or equal to said first cross-sectional flow area.

4. The milking claw according to claim 3 wherein said second cross-sectional flow area is defined by said second vertical height and by a lateral

width substantially greater than said second vertical height.

5. The milking claw according to claim 4 wherein milk in said flow passage flows along a flow axis, and wherein said nozzle opening comprises a generally horizontally extending slot comprising first, second and third sections, said second section being between said first and third sections, said second section extending transversely of said flow axis, said first and third sections extending from said second section on laterally distally opposite sides of said flow axis.

6. The milking claw according to claim 5 wherein:  
said first section extends generally horizontally and parallel to said flow axis from a first end to a second end;  
said second section extends generally horizontally and transversely to  
5 said flow axis from a first end to a second end;  
said third section extends generally horizontally and parallel to said flow axis from a first end to a second end;  
said width of said second cross-sectional flow area is the cumulative extension of said slot along said first, second and third sections.

7. The milking claw according to claim 6 wherein:  
said first end of said first section is an open end;  
said second end of said first section is a closed end;  
said first end of said second section is an open end;  
5 said second end of said second section is an open end;  
said first end of said third section is an open end;  
said second end of said third section is a closed end;  
said first open end of said first section merges with said first open end of said second section and provides a continuous nozzle opening slot thereat;  
10 said first open end of said third section merges with said second open

end of said second section and provides a continuous nozzle opening slot thereat;

15 said slot is a continuous extension from said second closed end of said first section to said second closed end of said third section, namely extending from said second closed end of said first section then along said first section to said first open end of said first section then to said first open end of said second section then along said second section to said second open end of said second section then to said first open end of said third section then along said third section to said second closed end of said third section;

20 said width of said second cross-sectional flow area is said continuous extension of said slot.

8. The milking claw according to claim 3 wherein:

said claw bottom has a sidewall;

5 said tubular member of said outlet extends from said sidewall exteriorly from said claw bottom;

said outlet further comprises an awning extending from said sidewall interiorly of said claw bottom and defining a slot providing said nozzle opening.

9. The milking claw according to claim 8 wherein:

milk in said flow passage flows along a flow axis;

5 said awning extends into said claw bottom along said flow axis to an inner awning tip spaced from said sidewall;

said awning has a pair of awning edges extending from said sidewall to said inner awning tip, said awning edges being on laterally distally opposite sides of said flow axis;

said slot extends along said inner awning tip and along each of said awning edges.

10. The milking claw according to claim 9 wherein:

said claw bottom has an interior lower surface;  
    a first of said awning edges has a first bottom surface spaced above said lower interior surface of said claw bottom by a first gap;  
5      said inner awning tip has a second bottom surface spaced above said lower interior surface of said claw bottom by a second gap;  
    a second of said awning edges has a third bottom surface spaced above said lower interior surface of said claw bottom by a third gap;  
    each of said first, second and third gaps has a vertical height less than  
10     said first vertical height;

11.    The milking claw according to claim 10 wherein said first, second and third gaps are horizontally continuous and define said slot.

12.    The milking claw according to claim 11 wherein said slot has a U-shape in a horizontal plane.

13.    The milking claw according to claim 1 wherein:  
    said claw bottom has a sidewall and an interior lower surface;  
    said sidewall has a section with a tip spaced from said interior lower surface by a gap providing said nozzle opening;  
5      said claw bottom has a recessed surface below said interior lower surface and extending through said sidewall exteriorly of said claw bottom and into said flow passage of said outlet tubular member.

14.    The milking claw according to claim 13 wherein said gap has a vertical height equal to said second vertical height.

15.    The milking claw according to claim 14 wherein:  
    said first vertical height extends between upper and lower reaches;

5        said second vertical height extends between upper and lower reaches;  
        said upper reach of said second vertical height is below said upper  
 reach of said first vertical height;

      said lower reach of said second vertical height is above said lower  
 reach of said first vertical height.

16.      The milking claw according to claim 1 wherein said claw bottom has distally opposite first and second ends defining a longitudinal axis therebetween, and comprising a dividing wall dam extending longitudinally along said longitudinal axis from one of said ends part way towards the other of said ends,  
5        and wherein said outlet is at said other of said ends opposite said one end and longitudinally spaced from said dam by a longitudinal gap therebetween.

17.      The milking claw according to claim 16 wherein said claw bottom has lower interior surfaces sloped from areas adjacent said dividing wall dam towards said outlet to promote drainage to said outlet.

18.      The milking claw according to claim 16 wherein said claw bottom has interior surfaces shaped to form a path for milk to flow from areas adjacent said dividing wall dam towards said outlet.

19.      The milking claw according to claim 16 wherein said claw top has a plurality of said inlets, including one inlet supplying milk to said one end of said claw bottom, and another inlet supplying milk to said other end of said claw bottom, and wherein said claw bottom has interior surfaces shaped to form a path for milk to travel from areas adjacent said dividing wall dam towards said outlet without intersecting flow from said other of said inlets until the milk is adjacent said outlet.  
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20.      The milking claw according to claim 1 wherein said claw

bottom has interior contoured surfaces tangentially receiving milk flow from said claw top.

21. The milking claw according to claim 1 wherein said tubular member has an exterior section extending exteriorly of said claw bottom, and an interior section extending interiorly of said claw bottom, said interior section defining a slot providing said nozzle opening, said interior section having concavely curved and radiused portions facing said flow passage and extending from said slot to facilitate gentle flow of milk and to facilitate easier cleaning.

22. The milking claw according to claim 1 wherein said claw bottom has lower interior surfaces sloped from distal areas towards said outlet to promote drainage to said outlet.

23. A milking claw for a dairy animal having a backbone defining an axially extending longitudinal direction, and an udder having four teats comprising a front pair of laterally spaced teats and a rear pair of laterally spaced teats, said claw having a top having four inlets directing incoming milk flow into said claw respectively from said four teats, said claw having a bottom having an outlet subject to vacuum for drawing milk therefrom, said claw lying along a central longitudinal axis extending between the animal's legs and generally parallel to said backbone, said inlets comprising a front pair of first and second inlets laterally spaced on opposite sides of said longitudinal axis and receiving milk from said front pair of teats and directing such milk rearwardly into said claw on laterally opposite sides of said longitudinal axis, and a rear pair of third and fourth inlets laterally spaced on opposite sides of said longitudinal axis and receiving milk from said rear pair of teats and directing such milk forwardly into said claw on laterally opposite sides of said longitudinal axis, said outlet comprising a tubular member extending laterally from said claw bottom and having a flow passage of a first vertical height, a nozzle having

an opening passing milk therethrough from said claw bottom to said flow passage, said nozzle opening having a second vertical height less than said first vertical height, such that milk level in said claw bottom need only rise to the level of the second lower vertical height of said nozzle opening rather than to the level of the first higher  
20 vertical height of said flow passage of said outlet tubular member, to provide a pressure differential between the vacuum in said outlet and the vacuum in said claw, whereby to draw milk from said claw in smaller more frequent slugs as compared to higher volume less frequent slugs while otherwise waiting for milk level in said claw bottom to rise to the level of said first vertical height.

24. The milking claw according to claim 23 wherein:

said claw top has a first opening from which said first inlet extends forwardly;

5 said claw top has a second opening from which said second inlet extends forwardly;

said claw top has a third opening from which said third inlet extends rearwardly;

said claw top has a fourth opening from which said fourth inlet extends rearwardly;

10 said first and third openings are on a first lateral side of said longitudinal axis;

said second and fourth openings are on a second lateral side of said longitudinal axis;

15 said first opening introduces milk flow into said claw along a first rearwardly directed milk flow path traversing rearwardly of said third opening;

said second opening introduces milk flow into said claw along a second rearwardly directed milk flow path traversing rearwardly of said fourth opening;

said third opening introduces milk flow into said claw along a third forwardly directed milk flow path traversing forwardly of said first opening;

20                   said fourth opening introduces milk flow into said claw along a fourth forwardly directed milk flow path traversing forwardly of said second opening;

                  said first and third milk flow paths are nonintersecting such that milk flowing from said first opening along said first milk flow path does not intersect milk flowing from said third opening along said third milk flow path;

25                   said second and fourth milk flow paths are nonintersecting such that milk flowing from said second opening along said second milk flow path does not intersect milk flowing from said fourth opening along said fourth milk flow path.

25.    The milking claw according to claim 24 wherein:

                  said first opening is rearward of said third opening;

                  said second opening is rearward of said fourth opening.

26.    The milking claw according to claim 24 wherein said first and third openings have leading portions laterally adjacent each other, and said second and fourth openings have leading portions laterally adjacent each other.

27.    The milking claw according to claim 24 wherein said first and third openings have trailing portions longitudinally spaced from each other, and said second and fourth openings have trailing portions longitudinally spaced from each other.

28.    The milking claw according to claim 23 wherein:

                  said claw top has first, second, third and fourth interior contoured surfaces respectively directing milk therealong from said first, second, third and fourth inlets;

5                   said first and third inlets and said first and third contoured surfaces are on a first lateral side of said longitudinal axis;

                  said second and fourth inlets and said second and fourth contoured

surfaces are on a second lateral side of said longitudinal axis opposite said first lateral side;

10 milk entering said claw through said first inlet flows rearwardly along said first contoured surface on said first lateral side of said longitudinal axis;

milk entering said claw through said second inlet flows rearwardly along said second contoured surface on said second lateral side of said longitudinal axis;

15 milk entering said claw through said third inlet flows forwardly along said third contoured surface on said first lateral side of said longitudinal axis;

milk entering said claw through said fourth inlet flows forwardly along said fourth contoured surface on said second lateral side of said longitudinal axis;

20 said first and third contoured surfaces are longitudinally spaced from each other such that milk flowing rearwardly along said first contoured surface does not impinge milk flowing forwardly along said third contoured surface;

said second and fourth contoured surfaces are longitudinally spaced from each other such that milk flowing rearwardly along said second contoured surface does not impinge milk flowing forwardly along said fourth contoured surface.

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29. The milking claw according to claim 28 wherein said claw bottom has longitudinally spaced front and rear ends;

30 said first contoured surface directs milk flow rearwardly and downwardly to said rear end of said claw bottom on said first lateral side of said longitudinal axis;

said second contoured surface directs milk flow rearwardly and downwardly to said rear end of said claw bottom on said second lateral side of said longitudinal axis;

35 said third contoured surface directs milk flow forwardly and downwardly to said front end of said claw bottom on said first lateral side of said longitudinal axis;

5 said fourth contoured surface directs milk flow forwardly and downwardly to said front end of said claw bottom on said second lateral side of said longitudinal axis.

30. The milking claw according to claim 29 wherein said first, second, third and fourth contoured surfaces terminate substantially tangentially to respective mating surfaces of said claw bottom such that milk is delivered to said claw bottom with minimal splashing.

31. The milking claw according to claim 28 wherein said first, second, third and fourth contoured surfaces are initially substantially tangential to said first, second, third and fourth milk flow paths, respectively, from said first, second, third and fourth inlets, respectively.

32. The milking claw according to claim 28 wherein:

said claw top has longitudinally spaced front and rear ends;

said first contoured surface has a leading end at said first inlet and has a trailing end at said rear end of said claw top;

5 said second contoured surface has a leading end at said second inlet and has a trailing end at said rear end of said claw top;

said third contoured surface has a leading end at said third inlet and has a trailing end at said front end of said claw top;

10 said fourth contoured surface has a leading end at said fourth inlet and has a trailing end at said front end of said claw top;

said leading end of said first contoured surface is rearward of said leading end of said third contoured surface;

said leading end of said second contoured surface is rearward of said leading end of said fourth contoured surface.

33. The milking claw according to claim 28 wherein said first contoured surface is spaced laterally from said second contoured surface to separate the flow from said first inlet from the flow from said second inlet, and said third contoured surface is spaced laterally from said fourth contoured surface to separate 5 the flow from said third inlet from the flow from said fourth inlet.

34. The milking claw according to claim 28 comprising:

a rearward separational surface laterally between said first and second contoured surfaces and providing a rearward separational director therebetween,

5 said rearward separational director directing milk flow from said first inlet along said first contoured surface and away from said second contoured surface,

said rearward separational director directing milk flow from said second inlet along said second contoured surface and away from said first contoured surface;

10 a forward separational surface laterally between said third and fourth contoured surfaces and providing a forward separational director therebetween,

said forward separational director directing milk flow from said third inlet along said third contoured surface and away from said fourth contoured surface,

15 said forward separational director directing milk flow from said fourth inlet along said fourth contoured surface and away from said third contoured surface.

35. The milking claw according to claim 23 wherein:

said first, second, third and fourth inlets comprise first, second, third and fourth tubular members, respectively, each tubular member having an entry end and a discharge end and a tubular extension therebetween;

5 said tubular extensions of said first and third tubular members

longitudinally cross each other on a first lateral side of said longitudinal axis;  
said tubular extensions of said second and fourth tubular members  
longitudinally cross each other on a second lateral side of said longitudinal axis, said  
second lateral side being opposite to said first lateral side.

36. The milking claw according to claim 35 wherein:

said entry end of said first tubular member is forward of said entry end  
of said third tubular member;

5 said discharge end of said first tubular member is rearward of said  
discharge end of said third tubular member;

said entry end of said second tubular member is forward of said entry  
end of said fourth tubular member;

said discharge end of said second tubular member is rearward of said  
discharge end of said fourth tubular member.

37. The milking claw according to claim 35 wherein:

said claw top has longitudinally spaced front and rear ends;

5 milk from said first teat flows rearwardly through said first tubular  
member and is discharged rearwardly into said claw to flow rearwardly toward said  
rear end of said claw top;

milk from said second teat flows rearwardly through said second  
tubular member and is discharged rearwardly into said claw to flow rearwardly  
toward said rear end of said claw top;

10 milk from said third teat flows forwardly through said third tubular  
member and is discharged forwardly into said claw to flow forwardly toward said  
front end of said claw top;

milk from said fourth teat flows forwardly through said fourth tubular  
member and is discharged forwardly into said claw to flow forwardly toward said  
front end of said claw top;

15                    said discharge ends of said first and third tubular members are on a first lateral side of said longitudinal axis;

                      said discharge ends of said second and third tubular members are on a second lateral side of said longitudinal axis, said second lateral side being opposite to said first lateral side;

20                    milk flow from said first tubular member does not intersect milk flow from said third tubular member along said claw top because milk flows rearwardly from said discharge end of said first tubular member from a point rearward of said discharge end of said third tubular member;

                      milk flow from said second tubular member does not intersect milk flow from said fourth tubular member along said claw top because milk flows rearwardly from the discharge end of said second tubular member from a point rearward of said discharge end of said fourth tubular member;

25                    milk flow from said third tubular member does not intersect milk flow from said first tubular member along said claw top because milk flows forwardly from said discharge end of said third tubular member from a point forward of said discharge end of said first tubular member;

                      milk flow from said fourth tubular member does not intersect milk flow from said second tubular member along said claw top because milk flows forwardly from said discharge end of said fourth tubular member from a point forward of said discharge end of said second tubular member.

30                    milk flow from said fourth tubular member does not intersect milk flow from said second tubular member along said claw top because milk flows forwardly from said discharge end of said fourth tubular member from a point forward of said discharge end of said second tubular member.

35                    milk flow from said fourth tubular member does not intersect milk flow from said second tubular member along said claw top because milk flows forwardly from said discharge end of said fourth tubular member from a point forward of said discharge end of said second tubular member.

38.    The milking claw according to claim 35 wherein:

                      said first and third tubular members cross each other at a first crossing zone;

5                    said second and fourth tubular members cross each other at a second crossing zone;

                      and comprising:

a first structural connection member between said first and third tubular members at said first crossing zone;

10 a second structural connection member between said second and fourth tubular members at said second crossing zone.